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SENSING OF METEOROLOGICAL VARIABLES
BY LASER PROBE TECHNIQUES

In the period August 1, 1965 - January 31, 1966, the activities supported by this grant proceeded in the following directions.

The optical radar investigations of the aerosol layer at 20 km have continued. Data were collected through the year 1965; this makes observations available for further analysis for approximately 100 nights during 1964-1965. Comparisons of dust profiles with ozone profiles (obtained by the Air Force Cambridge Research Laboratories group) seem to indicate a negative correlation between the presence of dust and ozone in the 15-25 km region. These results will be reported at the American Geophysical Union meeting in Washington, D. C., in April 1966.

Final analyses and interpretation of our noctilucent cloud observations, made in Alaska and Sweden during the summer of 1964, have been carried out and are soon to be published in Tellus.

Work on the development of a Doppler optical radar has proceeded, and we have successfully measured speeds in the laboratory with a cw device, utilizing an He-Ne laser and heterodyne detection schemes.¹ We have assembled two argon lasers and are studying their mode structure. We are studying the mode properties of a ruby laser with a very short (25 mm) interferometer length. These studies are aimed at measuring the broadening of the scattered laser light, which is due to pressure and Doppler effects, by the use of "homodyne" rather than heterodyne techniques. This scheme should offer substantial advantages.

An experiment to measure Raman scattering of ruby light in the atmosphere has been proposed and measurements will soon be made.

This grant is also providing partial support for experiments that are being proposed to scatter optical radiation from electrostatic oscillations in a plasma.

A search for Comet Ikeya-Seki was carried out at the Haystack Facility of Lincoln Laboratory with the microwave radiometer system. Results indicated a very low brightness temperature.²

References

1. G. Fiocco and J. B. DeWolf, "Optical Doppler Radar I," Quarterly Progress Report No. 79, Research Laboratory of Electronics, M.I.T., Cambridge, Mass., October 15, 1965, pp. 45-46.
2. G. Fiocco, H. C. Koons, and M. L. Meeks, "Search for Comet Ikeya-Seki (1965f) at 8 Gc/sec and 15 Gc/sec," Quarterly Progress Report No. 80, Research Laboratory of Electronics, M.I.T., Cambridge, Mass., January 15, 1966, pp. 18-19.